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Dynamical instability induced by zero mode under symmetry breaking external perturbation

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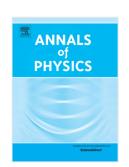
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#### ACCEPTED MANUSCRIPT

### Highlights

- Zero modes are important but ignored in many theories for cold atomic system.
- $\cdot$  We discuss the zero mode under symmetry breaking potential in this system.
- · We consider the zero mode of translational invariance for a single dark soliton.
- $\cdot$  We show that it turns into anomalous or pure imaginary mode.

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